Enabling Conservation Concessions in the Context of Guyana's Low-Carbon Development Strategy

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Date: April 24, 2014

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Masters project submitted in partial fulfillment of the
requirements for the Master of Environmental Management degree in
the Nicholas School of the Environment of
Duke University

2014

This report is dedicated to the loving memory of my mother. Her love, selfless giving, support, perseverance, and dedication continue to inspire me. Continue to rest in eternal peace Mom.

Acknowledgements

"And whatever you do in word or deed, do all in the name of the Lord Jesus, giving thanks to God the Father through Him." (Colossians 3: 17, New International Version)

I wish to express deep gratitude to everyone who provided support for my completion of this project and report. Without support from you all, this work would not have been possible. I would however like to single out the following persons for special mention.

I thank Dr. Brian Murray for his role as my academic advisor. The expert guidance and advice he provided have enriched both this project and my knowledge and skill.

My colleagues, both past and present, at Conservation International are recognized for their contributions in the model of conservation concessions. I am thankful for the data and documentation made available for completion of this study. I also appreciate the understanding shown by Dr. David Singh and the rest of the team at Conservation International Guyana in allowing me the time to do the work necessary for the completion and documentation of the study.

The data and input provided by Ms. Pradeepa Bholanath of the Guyana Forestry Commission were invaluable to the completion of this project. I am grateful for her assistance.

Finally, I thank Shonell and Adalyn, my family, for their understanding and support, especially at times when I was engrossed in completing analyses and writing this report.

Abstract

The reduction of green house gas emissions from deforestation and forest degradation, especially in tropical countries, is a necessary action for the mitigation of global climate change. Guyana is one of few countries which maintain a high forest cover (85%) and a low rate of deforestation (<0.1%). Guyana has articulated a Low Carbon Development Strategy (LCDS) by which it intends to maintain the climate regulation services provided by its forest and receive REDD+ payments. Increased deforestation, primarily form alluvial gold mining, however threatens success of the LCDS.

This master's project reviews the regulatory and policy environment for forest management in Guyana and utilizes experiences of the management of a conservation concession in the upper Essequibo River. The study analyzes benefits and costs of management of the conservation concession under the conditions of its establishment and three alternative scenarios. Recommendations are provided for the enabling of conservation concessions in the context of the LCDS.

The study recommends enacting regulatory conditions to limit deforestation, establishing means to mitigate and offset deforestation, and enabling optimal value flows for conservation concession management.

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List of Abbreviations and Acronyms

BCA – Benefit Cost Analysis

CI – Conservation International

CI-Guyana – Conservation International Guyana

CO_2 – Carbon Dioxide

EPA – Environmental Protection Agency of Guyana

GDP – Gross domestic product

GFC – Guyana Forestry Commission

GLSC – Guyana Lands and Surveys Commission

GRIF – Guyana REDD+ Investment Fund

IPCC – Intergovernmental Panel on Climate Change

LCDS – Low Carbon Development Strategy

NPV – Net Present Value

OP – Office of the President, Republic of Guyana

PSC – Private Sector Commission

REDD+ – Reduced Emissions from Deforestation and Forest Degradation including Forest Conservation, Sustainable Forest Management and Enhancement of Forest Carbon Stocks

RPP – Readiness Preparation Proposal

SFEP – State Forest Exploratory Permit

SFM – Sustainable Forest Management

TSA – Timber Sales Agreement

UECC – Upper Essequibo Conservation Concession

UNFCCC – United Nations Framework Convention on Climate Change

US$ – United States Dollars

VCIF – Voluntary Community Investment Fund

WWF-Guianas – World Wild Life Fund - Guianas

Introduction

Guyana is a small country of approximately 215,000 square kilometers on the northern coast of South America. The country's population is approximately 750,000 people most of whom live on the narrow strip along the Atlantic coast (Beaie, 2007). The economy of the country is primarily based on agriculture, and extractive activities such as logging and mining. Guyana has maintained almost all of its lands and ecosystems in an intact state with more than 90% of the country covered with natural ecosystems – mainly forest, savannahs and wetlands. Intact forests cover approximately 85% of the country (GFC, 2012a), most of which contain species with commercial timber value.

Despite relying on extractive activities for economic development, Guyana is one of only a few countries which maintain a high percentage of its original forest cover and continue to lose forest very slowly (da Fonseca et al., 2007). The annual rate of deforestation between 1990 and 2012 has been maintained between 0.010% and 0.079% (GFC, 2011a, 2012b, 2013). The country is however challenged to maintain this low rate of deforestation as it seeks to secure economic development at a much faster pace. This challenge is made even more difficult with high global market prices for minerals, gold in particular (CI-Guyana, WWF-Guianas, & Projekt-Consult GmbH, 2013).

Global Climate Change and Guyana's Forests

Global climate change, driven by increased emission of green house gases -- primarily carbon dioxide (CO_2) -- from anthropogenic sources, is among the greatest challenges facing civilization today. Studies suggest that between 12% and 17% of anthropogenic

CO_2 emission results from deforestation primarily in tropical countries (IPCC, 2007; van der Werf et al., 2009). Deforestation also reduces the natural sinks which remove CO_2 from the atmosphere, exacerbating the change. It is estimated that Guyana's 18.5 million hectares of forests (GFC, 2013) stores the equivalent of about five gigatons of CO_2 in its above ground biomass (GFC, 2012a). This stock is equal to about 15% of the total global green house gas emissions from all sources in 2011 (Olivier, Janssens-Maehout, & Peters, 2012).

Reduction of deforestation and forest degradation is recognized as one of the means by which global climate change can be addressed. Discussions within the United Nations Framework Convention on Climate Change (UNFCCC) are gearing towards establishment of a program for Reduced Emissions from Deforestation and Forest Degradation with conservation and sustainable forest management (REDD+). REDD+, if fully implemented by the UNFCCC, will allow for developing countries to be compensated for reduced CO_2 emissions achieved by reduction or avoidance of deforestation and forest degradation. Compensation could be through intergovernmental transfers or through payments linked to trading of carbon credits.

In 2009 Guyana articulated a strategy to transform its economy along a low-carbon trajectory while combating global climate change (OP, 2013). The Low-Carbon Development Strategy (LCDS) seeks to ensure maintenance of the global climate regulation services provided by Guyana's forest in return for payments to drive further investments in a low-carbon economy. These payments are expected to be realized

through agreements for REDD+; essentially for avoiding the emission of carbon stored within Guyana's forests as the country develops (OP, 2013). The Kingdom of Norway has pledged support for the LCDS and has agreed to pay Guyana up to a total of two hundred and fifty million United States dollars (US$250 Million) over a five year period ending in 2015 (Guyana & Norway, 2012).

The success of the LCDS is therefore dependent on the country finding ways to realize economic development that avoids extensive deforestation. Among the measures being implemented are the establishment and management of a national system of protected areas, and enhanced integration in the management of natural resource extraction (OP, 2013). Increased interest in extraction, particularly in mining and forestry, however threatens the success of these measures as deforestation continues to rise (GFC, 2011a, 2012b, 2013).

It is therefore an imperative that measures to reduce the impacts of the extractive activities which drive deforestation be implemented. These measures must however not adversely affect the country economically or socially. The incentivizing of forest conservation actions can be one of the most effective means available to realize the maintenance of a low deforestation rate.

Conservation Concessions

Direct payment for conservation has been effectively used, particularly in the United States, for more than half a century. Conservation easements are agreements, mostly between private land owners and conservation organizations, in which land owners

agree to conserve particular features or avoid certain types of development in exchange for payment or other incentives. In most conservation easements, possession and management of the land remains with the owner (The Nature Conservancy, 2014).

Conservation concessions are easement type agreements between owners of forest resources, most times the State, and concessionaires (resource managers) for the maintenance of ecosystems and biodiversity through avoidance of logging. The concessionaire assumes management of the forested lands and provides payments to the resource owners comparable to what might be earned through extractive uses (Rice, 2002). The concept, introduced by Conservation International (CI), aims to enable biodiversity conservation and protection to much better compete with extraction and conversion. It complements a suite of similar concepts which aim to provide incentives for conservation especially in developing countries with heavy reliance on exploitation for economic development (Rice, 2002).

The first conservation concession agreement was established in Peru in 2001 for 130,000 hectares of the forested Peruvian Amazon (Ellison, 2003; Hardner & Rice, 2002; Rice, 2002). Peru had only a few months prior amended its forestry laws to specifically allow entities to bid for concessions for biodiversity conservation in the same way that logging companies bid for forest concessions (Ellison, 2003; Hardner & Rice, 2002).

In 2002, the Upper Essequibo Conservation Concession (UECC) was established through an agreement between Conservation International Guyana (CI-Guyana) and the Guyana Forestry Commission (GFC) to lease an area of 82,199 hectares of intact

forest for thirty years (CI-Guyana, 2013; Ellison, 2003; GFC, 2002). The UECC was primarily established to realize biodiversity conservation within Guyana's policy environment which favored extraction (CI-Guyana, 2002, 2007, 2013; Ellison, 2003). CI-Guyana managed the UECC for ten years before ending the concession agreement prematurely (CI-Guyana, 2013).

Unlike the concession in Peru, the UECC was established under laws which made no specific provisions for conservation leases (CI-Guyana, 2013). However, Guyana's statutory and other provisions for forest management have since changed significantly embracing forest conservation as a central pillar ("Forest Act," 2009; GFC, 2012a; OP, 2013). Revised forestry legislation, allowing conservation concessions in Guyana, was passed in 2009 ("Forest Act," 2009).

Conservation concessions can serve beyond biodiversity conservation to play a pivotal role in the success of the LCDS. They can be key tools to deliver zero deforestation in portions of Guyana's forest estate to compensate for higher deforestation rates associated with extraction (CI-Guyana, 2013). Conservation concessions can enable Guyana to couple extraction with conservation to realize optimum management of deforestation, and enable success of REDD+ and the LCDS.

CI's experience in managing the UECC suggests that the relationship between costs borne and benefits enjoyed by key stakeholders is a key determinant of success (CI-Guyana, 2013).

Study Aim

This study utilizes the experience of managing the UECC from 2002 to 2012 to analyze economic costs and benefits of management of the site. These analyses of benefits and costs together with review of the legislative and regulatory policy framework for forest management in Guyana provide the basis for recommendations for the creation of enabling conditions for the realization of the potential of conservation concessions. The study examines the benefit-cost relationships under alternative regulatory conditions with and without REDD+, and logging follow sustainable forest management (SFM) guidelines.

Forest Management and the LCDS

Over the course of its recent history, Guyana has relied mainly on extraction of timber and minerals from the country's vast forests, and agriculture on the Atlantic coast for economic growth. In recent years, with high world prices for gold, mining has become the largest production activity in the country, accounting for 8.6% of the total gross domestic product (GDP) in 2012 and 23% of GDP when the contribution of services are not considered (Statistics, 2013). Forestry's contribution to GDP has decreased in recent years, from US$54.79 million (10% of non-service GDP) in 2006 to US$44.43 million (7% of non-service GDP) in 2012. Forestry production was projected to decrease further to US$41.94 million (6% of non-service GDP) in 2013 (Statistics, 2013).

Lands in Guyana are either public, private or community owned; the vast majority are publicly owned and managed by the State. Private lands are mostly small residential

holdings primarily on the coast where most of the population exists. Amerindians – indigenous Guyanese – currently own and manage approximately 14% of the country's landmass through communal land titles (GLSC, 2013).

Public lands and the resources they contain are managed in a piecemeal manner by several State agencies mainly for forestry, mineral and agriculture production, and protection and conservation (GLSC, 2013). Twelve million eight hundred thousand hectares of the forested public lands are designated the State Forest Estate and administered mainly for forestry production and conservation through the GFC (GFC, 2011b).

The GFC is responsible for advising on forest policy, establishing and implementing standards for the sector, implementing forest protection and conservation, overseeing forest research, and providing guidance to capacity building for the sector (GFC, 2008). The Commission is also the focal point for Guyana's efforts towards the establishment of a national program for REDD+ (GFC, 2012a).

LCDS, REDD+ and Agreement with Norway

In 2009, Guyana became one of the first countries to present a national strategy to transform its economy in a manner that avoids the deforestation that can result from rational forest uses for development. The LCDS essentially commits Guyana to managing its forests in a manner that keeps the rate of deforestation low. The country expects to receive REDD+ payments for the climate benefits provided by its actions (OP, 2013).

Guyana is at the forefront of REDD+ globally having taken several innovative steps towards shaping how countries with high forest cover and low rates of deforestation can contribute to addressing carbon emission and climate change. A Readiness Preparation Proposal (RPP) outlining plans for REDD+ at the national level has been submitted to the Forest Carbon Partnership Facility of the World Bank (GFC, 2012a); a system for the monitoring, reporting and verification of emissions from deforestation is in place (GFC, 2011a, 2012b, 2013); methods are being explored for the establishment of a reference level for future emissions against which performance would be better measured (GFC, 2013); and a mechanism for the receipt and administration of payments has been established – the Guyana REDD+ Investment Fund (GRIF) (GRIF, 2012b; OP, 2013).

Guyana's advanced state of readiness for REDD+ has been bolstered mainly by an agreement with the Kingdom of Norway. The agreement provides Guyana with the opportunity to earn up to US$250 million over five years to 2015 for the climate services provided by keeping its deforestation below an agreed threshold (Guyana & Norway, 2012). Guyana has up to the end of 2012 received three payments totaling US$115 million under the agreement (GRIF, 2012a) and a fourth payment is being determined on performance for 2012.

Under the agreement with Norway, Guyana is eligible for payments calculated at US$5 per ton CO_2 emission avoidance. The emission avoidance is calculated by firstly determining the amount of avoided deforestation then converting this using an interim

factor of 367 ton CO_2 per hectare (100 ton Carbon per hectare) deforestation. The deforestation avoided is established by determining the difference between the actual measured deforestation in a period and an interim reference level set at 0.275%. The reference level was established using a combined reference level methodology based on equal weighting of the mean historic baseline annual deforestation rate in Guyana between 2000 and 2009 (0.03%) and the mean annual deforestation rate in developing countries with deforestation from 2005 to 2009 (0.52%) (Guyana & Norway, 2012).

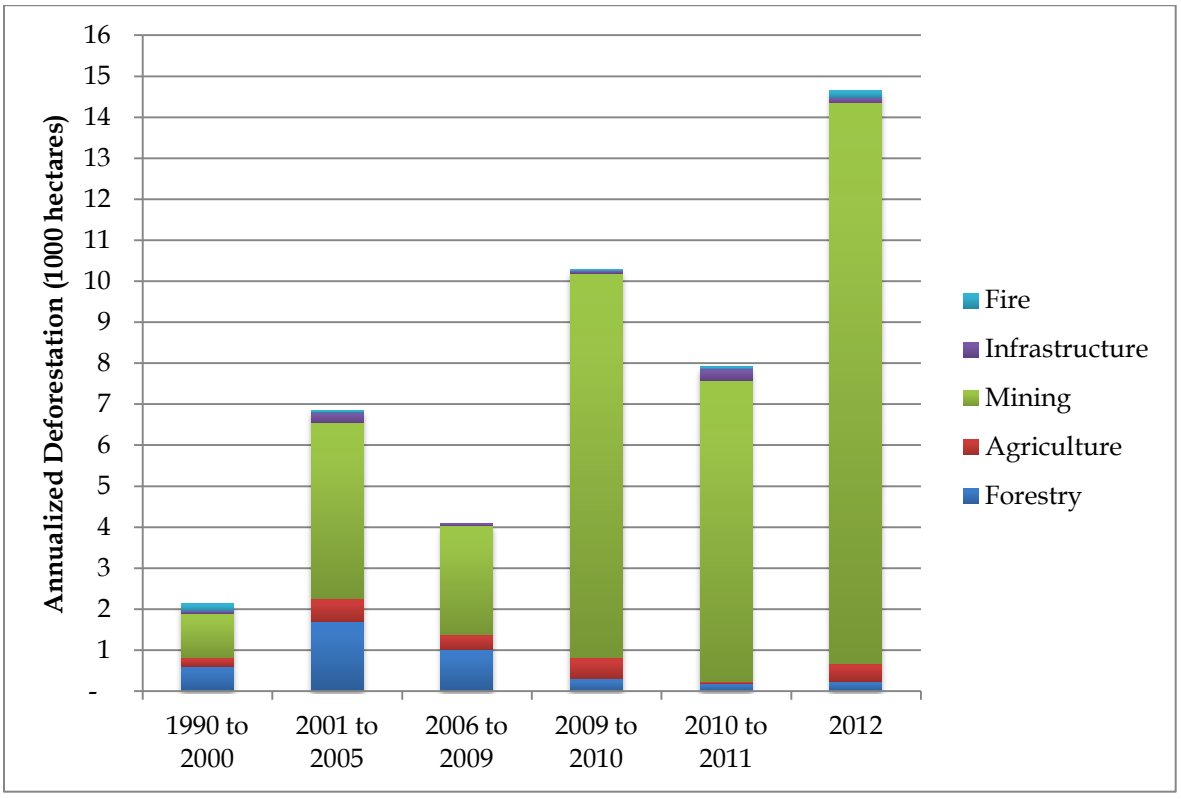
With the large gap between Guyana's deforestation rate in 2009 and the agreed reference level, it was agreed that Guyana will receive reduced payments for units of deforestation above 0.056%. No payment is made for years that deforestation reaches or exceeds 0.1%. This is intended to discourage continuation of business as usual in forest management while recognizing the need for some development activities which will result in deforestation (Guyana & Norway, 2012). Essentially, Guyana has committed that, while it can rationally increase its deforestation rate to 0.275% annually, ideally its future annual deforestation with a low-carbon economy will remain at or below 0.056% and never rise above 0.1%. This is equivalent to between 10,353 and 18,488 hectares of deforestation per year at the current forest cover (GFC, 2013).

Drivers of Deforestation in Guyana

Using advanced remote sensing and other technologies, and an increasing level of verification on the ground, the GFC has been tracking changes in Guyana's forest cover in recent years. Three assessments have been completed covering 1990 to 2012 (GFC,

2011a, 2012b, 2013) and an assessment for 2013 is currently due. Through these assessments, it has been determined that activities associated with mining – mainly small-scale alluvial gold mining – are the leading drivers of deforestation in Guyana. Mining was responsible for 93% of the total deforestation in 2012, and contributed similar portions in the two years prior (***Figure 1***) (GFC, 2011a, 2012b, 2013). This increase is closely associated with increased activity in the sector fueled by high world prices for gold (CI-Guyana et al., 2013).

Figure 1: Graph showing annualized deforestation in Guyana by drivers between 1990 and 2012. Source (GFC, 2011a, 2012b, 2013).



The importance of mining to Guyana's development extends beyond economics to include socio-cultural issues and thus is an extremely important aspect of the nation.

Guyana's mining sector is made up of primarily small and medium scale gold mines operated mostly on personal investments (CI-Guyana et al., 2013). The mining sector is also the main source of employment for a large number of persons (Thomas, 2009).

Efforts are being made, though currently with little impact, to improve the performance of the sector with regards to deforestation and other environmental and social impacts. These measures include improving monitoring and enforcement capacity, enhancing integration of mining and forestry planning and management, and improving site reclamation and after use (PSC, CI-Guyana, & WWF-Guianas, 2013).

The deforestation limits committed to by Guyana has established a deforestation budget for the country (CI-Guyana, 2013). The country must effectively manage this budget to maximize the returns on its investment. Current activities which result in deforestation, such as mining, must become more efficient in terms of the unit production per unit of deforestation and degradation created. Additionally, a suite of new economically beneficial forest uses that result in little or no deforestation must be encouraged. Conservation concessions within the State Forest Estate can be one such use.

With Guyana's changed policy environment, it is necessary to reform the model of conservation concessions implemented in the country for effectiveness. A reformed model must take the realities of REDD+ and the LCDS into account. Assessment of the experience managing the UECC is an appropriate point from which this reform should commence.

Policy Review

Article 36 of the Constitution of the Co-operative Republic of Guyana (1980) outlines the commitment of the State to sustainable development and environmental protection. The LCDS sets the overarching framework for the management of Guyana's forests, committing to the maintenance of low levels of deforestation (OP, 2013). The LCDS however does not establish legislation to regulate deforestation by forest users.

Management of the State Forest is primarily legislated by the Forest Act of 2009 and effected through the GFC ("Forest Act," 2009). Guyana's forest policy is further articulated within a National Forest Policy Statement (GFC, 2011b). Forest management is also influenced by laws governing the establishment and management of Amerindian village lands ("Amerindian Act," 2006); the leasing and management of lands for mining ("Mining Act," 1989); and environmental management ("Environmental Protection Act," 1996).

Forest Act of 2009

Unlike the Forest Act (1953), the Forest Act (2009) includes specific provisions for the issuing of leases to portions of the state forest estate for forest conservation. The Forest Act (2009) defines "forest conservation operations" to include: "the preservation of forests for the purpose of carbon sequestration or any other form of environmental services; the conservation of biological diversity; and eco-tourism" (section 2).

Sub-section (2)(c) of Section 6 of the Forest Act (2009) makes provisions for the Commissioner of Forests to grant concessions for the conduct of forest conservation

operations after consideration of applications. Sub-section (3) of Section 6 allows for such concessions to be granted “even if forest produce suitable for commercial use occurs in the area”("Forest Act," 2009, section 6(3)).

Section 8 of the Forest Act of 2009 lays out conditions for the granting or renewal of concessions larger than 8,097 hectares. Sub-section (1)(b) of this section allows for persons, which it defines to include local and international non-governmental organizations, who satisfy requirements for the right to carry out forest conservation operation, to be granted concessions for this purpose ("Forest Act," 2009, section 8 (1)(b)).

Under the new legislation, an exploratory permit is not required for granting of concessions for conservation. Exploratory permits are prerequisite for logging concessions and granted for up to three-years ("Forest Act," 2009).

Operations within the State Forest Estate, for both conservation and extraction, must be carried out in accordance with an approved management plan covering at least five years of operation. The law also makes provisions for the preparation of annual operational plans ("Forest Act," 2009).

Payment of a security bond is required according to Section 13. This bond is required in lieu of any future fees, penalties and other charges. Section 13 also provides for waiver of the bond in cases after public notification and engagement on the reasons for the waiver ("Forest Act," 2009).

The Act empowers the GFC to prepare codes of practice to regulate activities in all types of forest concessions. These codes of practice, once approved, together with the Forest Act of 2009 and regulations made under the Act govern activities in the state forest estate ("Forest Act," 2009, section 35).

Section 10 of the Forest Act of 2009 also makes provision for issuing of Annual Use Permits for non-extractive occupation of portions of the State Forest Estate. These uses include scientific research and ecotourism ("Forest Act," 2009, section 10).

Part 3 of the Act also provides for collaboration with the Environmental Protection Agency to create Specially Protected Areas. Specially protected areas can be created for up to 25 years and are designated for the conservation of biodiversity, soil and water resources, protection of species, or protection of forests from degradation, fires, pest and diseases ("Forest Act," 2009).

Concessions and other authorizations to the State Forest Estate issued under the forest Act (2009) do not confer exclusive rights of occupation and use unless explicitly stated in the authorization. The Act however does protect against issuance of multiple authorizations for any forest resource in an area ("Forest Act," 2009, section 14). It is therefore possible that multiple authorizations can be issued to an area for different forest and other resources, by different agencies. This presents challenges in the management of forestry resources as clearance of forest is required in order to access some resources such as minerals.

Other Relevant Land use Legislation

The Mining Act of 1989 establishes that "all minerals within the lands of Guyana shall vest in the state" (section 6). This Act further confers upon a commission – Guyana Geology and Mines Commission – powers to grant licenses or permits "to enter on State lands and there search or mine for, take and appropriate, minerals" ("Mining Act," 1989, section 7 (3)). Section 9 of the Mining Act of 1989 further limits the rights to mineral resources through other grants to State lands issued after 1903.

Section 13 (2) of the Amerindian Act of 2006 establishes that "[a] Village Council may assign tasks but may not delegate its functions to any other person." Establishing that villages, through their village councils, are the only entities with the power to manage lands titled to them. Part V of the Act however outlines the roles of national resource management agencies in assisting villages in managing mineral and forest resources on village lands. This section of the Act establishes that the GFC has responsibility of monitoring forest operations by non-residents permitted by the village on village lands ("Amerindian Act," 2006, part V).

National Forest Policy Statement

Currently, activities of the GFC are guided by the National Forest Policy Statement promulgated in 2011(GFC, 2011b). This statement replaced a similar piece articulated in 1997 (GFC, 1997) and places management of Guyana's forests within the context of the LCDS and REDD+ initiatives. The 2011 policy statement outlines the need for integrated land use planning and the implementation of strategies for the resolution of land use conflicts in the context of sustainable management of Guyana's forests. Efforts at

conserving Guyana's forests, including the addition of conservation concessions as a category of forest allocation, are also outlined in the statement (GFC, 2011b).

The statement sets out that, "the overall objective of the National Forest Policy is the conservation, protection, management and utilization of the nation's forest resources, while ensuring that the productive capacity of the forests for both goods and services is maintained or enhanced"(GFC, 2011b, p. 16). Four specific objectives are outlined in the statement to:

> (a) promote the sustainable and efficient forest activities which utilise the broad range of forest resources and contribute to national development while allowing fair returns to local and foreign entrepreneurs and investors;
>
> (b) achieve improved sustainable forest resource yields while ensuring the conservation of ecosystems, biodiversity, and the environment;
>
> (c) ensure watershed protection and rehabilitation: prevent and arrest the erosion of soils and the degradation of forests, grazing lands, soil and water; promote natural regeneration, afforestation and reforestation; and protect the forest against fire, pests and other hazards; and
>
> (d) identify and quantify environmental services to generate forest incentives for national development. (GFC, 2011b, p. 16)

The Upper Essequibo Conservation Concession Experience

In 2002, management of Guyana's State Forest Estate was legislated by the Forest Act of 1953 which made no provision for the issuance of conservation concessions ("Forest Act," 1953). At the time, policies regarding forest management, though referring to the

importance of forest conservation, addressed economic benefits of the forest exclusively from resource extraction (GFC, 1997). International interests in Guyana's forest resources were growing bolstering the view of the possible economic benefits of forest exploitation. Barama Company Limited, a wholly owned subsidiary of a Malaysian conglomerate, had just over a decade earlier been granted a 1.6 million hectare concession in the northwest of the country (Barama Company Limited, 2013a, 2013b).

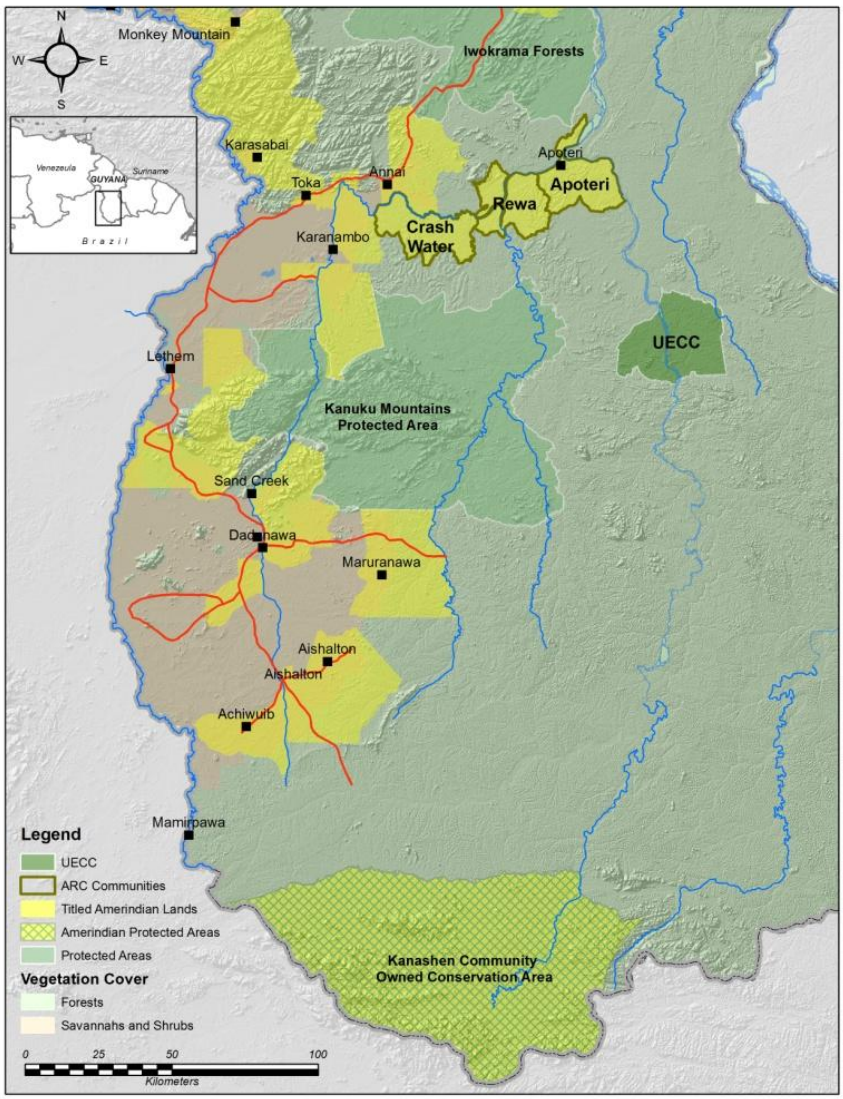
Faced with the challenge of securing long-term protection of Guyana's rich biodiversity in this economic policy environment, CI proposed the innovative concept of conservation concessions to the Government of Guyana (CI-Guyana, 2013; Rice, 2002). CI essentially offered to provide the State, and other stakeholders, revenues and other benefits comparable to those possible from logging to maintain the timber stock of an area of the State Forest Estate (CI-Guyana, 2013; Ellison, 2003; Rice, 2002).

The GFC leased CI-Guyana 82,199 hectares in the upper Essequibo River region through a Timber Sale Agreement (TSA) – the only legal means available at the time – in 2002 (CI-Guyana, 2013; GFC, 2002). CI-Guyana managed the UECC for ten of the thirty year of the lease and ended the agreement in 2012 (CI-Guyana, 2013). The site has not yet been reallocated; stakeholder communities have indicated to government their interest in ensuring the continuation of conservation management at the site.

Site Description

The UECC was located in the upper reaches of the Essequibo River – Guyana's largest river. The concession occupied densely forested road-less lands with the Essequibo River flowing through the site (***Figure* 2**).

Figure 2: Map showing the location of the UECC and stakeholder communities. Source (CI-Guyana, 2013).



Three communities were associated with the site based on their proximity and connection to the site. The Amerindian communities of Apoteri, Rewa and Crash Water are approximately 80, 115 and 160 kilometers away from the site by river, respectively (CI-Guyana, 2013). Current human use of the site is limited to occasional balata latex extraction and fishing by Amerindian communities closest to the site (CI-Guyana, 2002, 2007). Evidence of historical occupation has also been recorded (Simon, 2007).

The site of the UECC houses portions of the rich biodiversity of the Guiana Shield. Healthy populations of fish (Willink, Alexander, & Jones, 2013), primates and other mammals, and a diversity of plants can be found at the site (CI-Guyana, 2013). The forests of the site are mostly mixed forests with probably the most southern stand of the endemic and economically important Greenheart trees (*Chlorocardium rodiei*) (CI-Guyana, 2013). Twenty-one other commercial timber species have been recorded at the site. The densities of the commercial species recorded at the site are presented in *Table 1*.

Table 1: Density of commercial timber species in the UECC (GFC, 2006).

Species	Density (m^3/ha)
Special Category	
Bulletwood	0.18
Greenheart	5.23
Class 1	
Crabwood	0.10
Kabukalli	0.57
Locust	0.07
Mora	1.95
Morabukea	0.44

Shibadan	0.12
Simarupa	0.16
Suya	0.34
Ulu	0.08
Wamara	0.34
Class 2	
Baromalli	0.92
Dukali	0.25
Kereti Silverballi	0.01
Manni	0.07
Monkey Pot	0.07
Wallaba	0.37
Class 3	
Fukadi (Coffee Mortar)	0.07
Haiariballi	0.24
Kakaralli	0.40
Maho	0.18

The forests of the site also provide fresh water, carbon storage and other ecosystem services.

Establishing the UECC

Application for issuing of the UECC followed the established process for the acquisition of a lease for logging as laid out in the Forest Act of 1953 and regulations in force at the time. This was the only means available under existing laws to lease land within the State Forest Estate and required that CI-Guyana pay an application fee of US$20,000. Firstly, in 2001, CI-Gguyana acquired a State Forest Exploratory Permit (SFEP) to the site from the GFC (CI-Guyana, 2013; Hardner & Rice, 2002). Under the SFEP, CI-Guyana conducted a series of studies including a Social Impact Assessment and a

timber inventory, and prepared a management plan for site for approval by GFC (CI-Guyana, 2013).

Following approval of the management plan for the UECC, CI-Guyana made an application for a TSA as required by the laws in force at the time. The TSA for the UECC was similar to those issued for concessions for logging except that CI-Guyana was expected to ensure the conservation and management of the biodiversity at the site (CI-Guyana, 2013; GFC, 2002).

The Concession Agreement

The terms of the agreement for the UECC were similar to those for logging concessions. The agreement stipulated that CI-Guyana undertakes activities required of logging concessionaires including demarcation, signage, preparation of a management plan, and maintenance of records of forest resources taken from and operations carried out at the site (GFC, 2002).

The terms of the agreement also required payment of fees and other charges paid by loggers including a negotiated minimum annual royalty fee of US$11,000 (GFC, 2002). Though no logging was to take place at the site, payment of royalty was required to ensure the provision of comparable benefits to the state.

The agreement restricted activities to those approved in the management plan for the site but made no direct reference to biodiversity conservation (GFC, 2002). It required that management of the site be in accordance with the Environmental Protection Act 1996 which requires, among other things, environmental authorization for logging

operations ("Environmental Protection Act," 1996). The approved management plans for the UECC established biodiversity conservation objectives for management of the site (CI-Guyana, 2002, 2007).

UECC Management

The management objective of the UECC was to "maintain the biological diversity that is present in the concession, which includes the diversity of ecosystems and processes, of biological communities, and of plant and animal species" (CI-Guyana, 2002, 2007). The achievement of this objective was supported by four sub-objectives focused on the generation and sharing of knowledge on the biological and cultural values of the site; mitigation of adverse impacts to these values; generation of significant benefits to local communities and nationally; and promotion of the values and benefits of management of the site (CI-Guyana, 2002, 2007).

Administratively, the concession was managed through established CI-Guyana offices in Georgetown (Guyana's capital city) and Lethem (a township on the border with Brazil). An operational base was also established in Apoteri Village, the community closest to the concession site (CI-Guyana, 2002, 2007, 2013).

Staffing included four dedicated Conservation Officers chosen from two of the three stakeholder communities (CI-Guyana, 2002, 2007). The officers were trained, with CI-Guyana's support, through a recognized park ranger training program. The Conservation Officers provided day to day management of the concession and reported to a designated manager within CI-Guyana (CI-Guyana, 2002, 2007, 2013). In the early

years of management of the UECC, a dedicated Concession Manager was hired and located at the Apoteri base to oversee implementation of activities at the site (CI-Guyana, 2002, 2013). The wider CI-Guyana staff provided support for the management of the site.

The VCIF

CI-Guyana established a Voluntary Community Investment Fund (VCIF) as part of its efforts to alleviate potential negative social impacts of the management of the site for conservation rather than timber extraction, and maintain connection between the site and communities (CI-Guyana, 2013). The fund provided up to US$10,000 annually to support projects in the three stakeholder communities. The VCIF projects were intended to improve the standards of living in the communities, support growth of sustainable enterprises, enhance community project management capacities, and empower community residents. The fund, though successful to some extent, exhibited shortcomings in its design, governance, implementation and impact, especially in the early years (McIntosh, 2009).

Projects totaling US$82,520 were supported by the VCIF (CI-Guyana, 2014). These projects spanned areas such as the provision of equipment, infrastructure improvement, enterprise development and capacity building (CI-Guyana, 2013). More details on the projects supported by the VCIF can be found in Appendix 1.

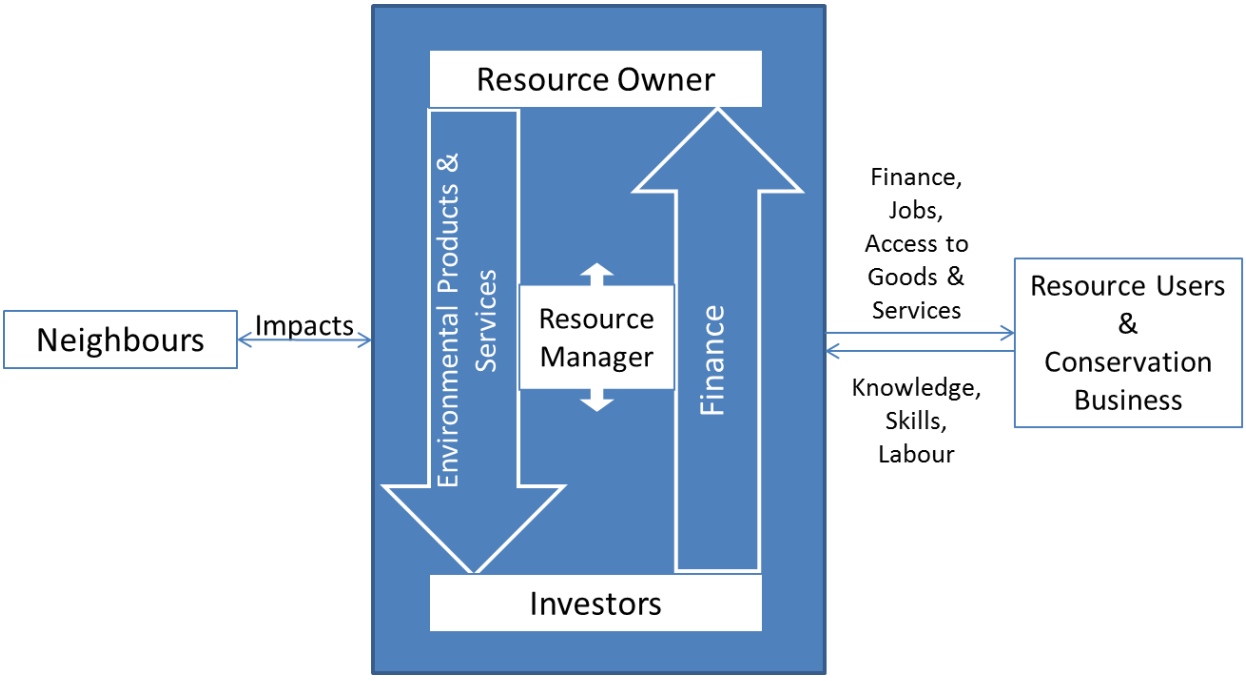
Stakeholder Involvement and Impacts

A large number of stakeholders were involved in the planning, establishment and management of the UECC. These entities and their roles changed as the project

progressed from stage to stage. Comparatively larger numbers of stakeholders were involved in the planning phase of the site as compared to the site operation phase (CI-Guyana, 2013). The planning phase included consultations with the local communities, community-based organizations, international organizations, government agencies, academic institutions, political parties, international development partners, the private sector, and indigenous advocacy groups. Much of the interaction with stakeholders at this stage was realized through regional and national advisory groups (CI-Guyana, 2002).

CI-Guyana identified six groups of stakeholders as being important to the implementation of a conservation concession in Guyana based on its experience managing the UECC. These are Resource Owners, Resource Managers, Resource Users, Investors, Conservation Business and Neighbors (CI-Guyana, 2013). One entity may, in cases, fulfill more than one stakeholder role in a conservation concession. For example, it is possible that a Resource Manager can also be an Investor and/or a Conservation Business. The generalized relationships between the various stakeholders are shown in Figure 3 below.

Figure 3: Generalized relationship of stakeholders in conservation concessions in Guyana. Source (CI-Guyana, 2013).



Resource Owners are the entities which have legal ownership of the area within which the conservation concession is located. In the case of a conservation concession in the State Forest Estate, such as the UECC, the State is the sole Resource Owner.

Resource Managers performs management of the assets of a conservation concession through agreement with the Resource Owner(s). CI-Guyana was the Resource Manager in the case of the UECC.

Resource Users are entities with legal or customary rights to use the assets of the concession. The communities of Apoteri, Rewa and Crash Water fell into this category in relation to the UECC.

Investors provide financing for the management of the site. Their return can be either financial or other gains, such as mission fulfillment. Investors may participate voluntarily in conservation concessions, as in the case of philanthropic donors. Legal requirement, such as those requiring project proponents to mitigate or compensate impacts through offsets, can also compel investment in conservation concessions. All investors to the UECC were voluntary and included mainly the Global Conservation Fund, and Save Your World – a US company which sold rainforest-based personal care products.

Conservation Businesses are enterprises which offer for sale good or services derived from the conservation concession such as tourism and ecosystem services. No conservation business was associated with the UECC.

Neighbors are owners or managers of lands adjacent to the conservation concession. In 2008, SFEPs were issued for two sites surrounding the UECC.

Each of the stakeholders in the implementation of the conservation concession bears some costs and receives benefits. CI-Guyana (2013) posits that the benefit-cost relationship, both in quantum and quality, for each stakeholder is a key determinant in the success of the management of the site. For success, the following four conditions must be met (CI-Guyana, 2013).

i. Benefit-cost relationship for Resource Owner(s) should be no less favorable than feasible alternative uses of the site.

ii. Benefits and cost to the Resource Manager must be at least equal or benefits must outweigh costs.

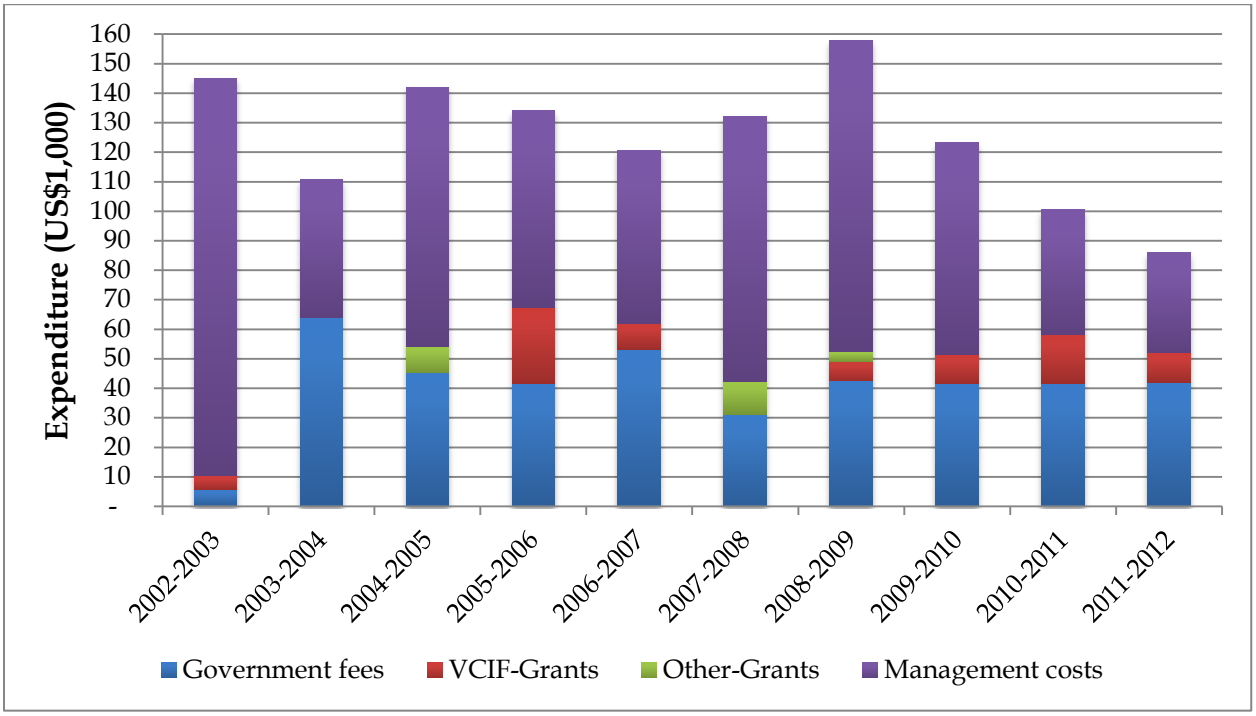
iii. Benefits must outweigh costs for Resource Users and Investors.

iv. Costs to Neighbors should not exceed benefits they receive. (CI-Guyana, 2013, p. 26)

Financing

CI-Guyana reports a total expenditure of US$1,252,122 over the ten years of management of the UECC. Thirty three percent of these costs were related to fees and royalties paid to the State through the GFC and the Guyana Environmental Protection Agency (EPA); 7% for VCIF projects in the communities; 2% for other projects in the area; and 59% for the management of the site inclusive of administration, capacity building and research (CI-Guyana, 2013, 2014). Annual expenditure by CI-Guyana for the UECC over the ten years of management by cost categories is shown in ***Figure 4*** below.

Figure 4: Annual expenditure by CI-Guyana for UECC from 2002 to 2012 (CI-Guyana, 2014).



Management cost as a percentage of total costs was highly variable over the first half of the period but showed a steady decline over the latter half. This is attributed to costs of several studies, training of the Conservation Officers and other expenses which were covered in the beginning of management of the site. Deliberate efforts were made to bring the cost of management of the site down beginning in 2008.

Fees paid by CI-Guyana included an annual acreage fee and royalty payments as required under the TSA. Additionally, CI-Guyana paid an annual environmental authorization fee, required of logging concessions under the Environmental Protection Act 1996. Annual acreage fees were determined at a rate of US$0.37 per hectare of land leased. Royalties are paid by logging concessions based on the class and volume of timber extracted. Since no timber was to be extracted from the UECC, the minimum

royalty payment of US$11,000 annually was established by negotiations (CI-Guyana, 2013; GFC, 2002). The environmental permitting fee was established at US$500 per year (CI-Guyana, 2013).

Analysis of Costs and Benefits

Methods and Data

Benefit Cost Analysis (BCA) of the management of the concession was conducted using standard BCA methods. The analyses considered ten annual periods commencing in July 2002 for comparability with management of the UECC. A 10% discount rate was used to compare values in different periods. Emphasis was placed on monetization of use values. However, qualitative assessments of costs and benefits were also conducted and factored into the results, discussion and recommendations.

The analysis was conducted from the perspectives of a Resource Manager or concessionaire, Resource Owners or the State, and a Resource User – the communities. Qualitative assessments of the benefits and costs to other stakeholders were also determined and discussed to inform the recommendations presented.

The Net Present Value (NPV) of management of the UECC site was determined under the arrangements of a conservation concession as demonstrated by the UECC and three alternative scenarios. The alternatives considered were management of conservation concessions under Guyana's national REDD+ program without requirements to offset deforestation impacts of high deforestation activities; inclusion of conservation concessions in the national REDD+ program with deforestation offsets; and logging

under the REDD+ program. All alternative scenarios assumed commencement of the LCDS and agreement with Norway in the first year, and that costs were incurred at the end of each period.

The REDD+ without deforestation offsets scenario assumed contractual arrangements for the concession being the same as those for the UECC but the value of the emission reduction effected was considered a positive externality of management. This scenario considers that Guyana establishes a national-level REDD+ program with no mechanisms to transfer benefits of avoiding deforestation from the State to Resource Managers and concessionaires.

The second alternative considered establishment of the conservation concession under a national REDD+ program with deforestation offsets required. Under this scenario, all concessions to forest lands for forestry, mining or other activities are allowed annual deforestation rates of 0.056%. Concessionaires who exceed this level of deforestation are required to ensure a net rate within the threshold by compensating those who manage their use activities to realize less deforestation than is allowed. Therefore a conservation concession realizing net zero deforestation can trade this excess deforestation with a miner to allow the miner deforest beyond his allowed limit. The miner would transfer some of this additional value as an offset payment. The net effect of this trade will be a total deforestation rate of 0.056% between the conservation concession and the mining concession.

The third alternative considered logging following sustainable forest management (SFM) guidelines within the concession with establishment of a national REDD+ program committing to a 0.056% deforestation threshold. A deforestation offset program was not considered under this scenario, therefore, reduction of emissions from deforestation was considered a positive externality.

It was assumed in all alternative scenarios that (1) under REDD+ 0.056% of every hectare of Guyana's forest can be deforested; and (2) no deforestation results from conservation management.

The sensitivity of the analyses to carbon pricing, deforestation offset payments, timber and gold prices, and the discount rate were investigated.

Benefit and cost data for this study were primarily gathered from CI-Guyana and GFC sources. Assumptions supported by literature supplemented data from CI-Guyana and the GFC when direct market values were not available. *Table 2* shows the benefits and costs considered in the study, the sources of data, and means of determining their values.

Table 2: Data sources and methods for monetizing costs and benefits

Benefits and Costs	**Methods and Source**
Emission reduction	Emission reduction was valued at the price per ton CO_2e currently set under the agreement between Guyana and Norway. It was assumed that this price represents the full market value of the emission reduction. Emission reduction

Benefits and Costs	**Methods and Source**
	was quantified based on establishing the difference between an allowed annual deforestation of 46.03 hectares (0.056% of 82,199 hectares) and the deforestation expected in the scenario being considered. Deforestation from logging in the concession was established by the product of the estimated log production from the concession and the national production efficiency (hectare deforestation from forestry per cubic meter production) for logging concessions in each period. Appendix 2c provides details of these calculations.
Deforestation offset payments	Deforestation offset payments represent the revenue to the concession from high deforestation uses (mainly mining) under scenarios which considered the establishment of the offset program. These payments were calculated as 10% of the market value of gold that could be produced by the same amount of deforestation as the surplus realized in the period. Potential gold production was estimated based on the gold production efficiency (ounces of gold produced per hectare deforestation from mining) in the period. Details of the calculation of deforestation offset payments are presented in Appendix 3.
Conservation Grants	The investment made by foundations and other donors for conservation management of the site was determined from CI-Guyana's records.
Timber sales	Annual sales that could be expected from sustainable logging of the concession under a 60-year logging cycle. It

Benefits and Costs	**Methods and Source**
	was assumed that log production from the concession would contain portions of the various classes of logs as recorded by timber inventories at the site. It was also assumed that the logging operation is able to take and market the same percentage of the annual allowable cut as estimated for the rest of the sector. See Appendix 2f for more details.
Economic impact to communities	The benefit of community development and other projects, employment for concession management, and the sale of goods and services to the concession were determined based on the cost to the concessionaire. The scope of this study did not allow for incorporation of the recurring benefit of returns on capital investments such as improved fresh water access and profits from enterprises. The value of VCIF and other projects supported by the UECC, community employment, and sale of goods and services from CI-Guyana's records were used for the conservation scenarios. The value under logging management was established at 10% of the total management cost (2% for community projects and 8% for employment). This level was determined from information provided by the GFC (Bholanath, 2014a).
Timber royalties	Timber royalty payments to the State by concessionaires were estimated following the method currently used in the industry, as shown in Appendix 5. It was assumed that log

Benefits and Costs	**Methods and Source**
	production from the concession would contain proportions of the various classes of logs as documented in the UECC. It was also assumed that the concession will yield the same percentage of the annual allowable cut as estimated for the rest of the sector. See Appendix 1 for more details.
Concession and other fees	This represents payments made by the concessionaire to the State. It includes application, acreage and environmental permitting fees, and in the case of the conservation scenarios the minimum royalty payment. Values from CI-Guyana's records for the UECC were used for the conservation scenarios. For the logging scenario the acreage and environmental permitting fee were assumed to be the same as for the UECC – US$0.37 per acre and US$500 respectively. All alternatives considered a required application fee of US$20,000 paid prior to the first year.
Concession Management	The costs of management of the concession by the concessionaire, including employment, administration, studies, and operating expenses were established from CI-Guyana's records for conservation management. For logging management, these costs were estimated from information provided by the GFC for 2012 – US$98.12 per cubic meter production (Bholanath, 2014a) – and the nation rate of inflation used to estimate costs for preceding years. See Appendix 2g for details.
Monitoring and	This represents costs to the GFC for monitoring and regulating concessions. This was estimated at 70% of the

Benefits and Costs	**Methods and Source**
Regulating	total expenditure by the GFC in each period (Bholanath, 2014b). The proportion of this cost which can be attributed to the site was estimated based on the product of management cost per hectare of land allocated in the period and the size of the concession. It was assumed that less monitoring and regulation is required under conservation management, thus the cost for the conservation scenarios was set at 75% of the value for logging concessions. See Appendix 4 for details.
Additional Gold Royalty and Taxes	Additional royalty and taxes to the State from additional mining allowed by the surplus deforestation available when offsets are considered. Miners pay 8% of the value of declarations in royalty and taxes (Alleyne, [Undated]). The additional production possible in each period was calculated based on the production efficiency (ounces of gold produced per hectare deforestation from mining) in that period. The value of the production was estimated based on the average global market price for gold during the period. It was assumed that all production will be declared in the period in which it is realized. See Appendix 3 for details.

Results

The results of the analysis for all four scenarios are presented below, individually and then all together with sensitivity tests.

Scenario 1: The UECC

Quantitatively, conservation grants to the concessionaire were identified as the largest single benefit, and management costs to the concessionaire the single largest cost of the management of the site under the conditions of the agreement for the UECC.

The NPV of management of the site as a conservation concession under the conditions of the UECC agreement was determined to be $157,592 to the Resource Owner; $0 to the Resource Manager; and $242,341 to Resource Users at a 10% discount rate.

Table 3 below shows the total benefit and cost, net benefit and NPV over the periods of the assessment for the three stakeholders. More details of the monetized costs and benefits under this scenario are presented in Appendix 6.

Table 3: Results of BCA at 10% discount rate for (a) Resource Owner, (b) Resource Manager, and (c) Resource Users under management as a conservation concession.

(a)

	Total Benefit	Total Cost	Net Benefit
0	$ 20,000	$ -	$ 20,000
1	$ 5,571	$ 12,842	$ (7,271)
2	$ 63,992	$ 12,842	$ 51,150
3	$ 45,422	$ 14,414	$ 31,008
4	$ 41,474	$ 15,736	$ 25,738
5	$ 53,190	$ 17,444	$ 35,746
6	$ 31,230	$ 24,061	$ 7,169
7	$ 42,496	$ 26,482	$ 16,014
8	$ 41,515	$ 26,203	$ 15,312
9	$ 41,669	$ 16,384	$ 25,285
10	$ 42,000	$ 21,200	$ 20,800
NPV at 10% discount rate			**$157,592**

(b)

	Total Benefit	Total Cost	Net Benefit
0	$ 20,000	$ 20,000	$ -
1	$ 145,136	$ 145,136	$ -
2	$ 110,682	$ 110,682	$ -
3	$ 142,062	$ 142,062	$ -
4	$ 134,039	$ 134,039	$ -
5	$ 120,613	$ 120,613	$ -
6	$ 132,114	$ 132,114	$ -
7	$ 157,810	$ 157,810	$ -
8	$ 123,124	$ 123,124	$ -
9	$ 100,590	$ 100,590	$ -
10	$ 85,951	$ 85,951	$ -
NPV at 10% discount rate			**$0**

(c)

	Total Benefit	Total Cost	Net Benefit
0	$ -	$ -	$ -
1	$ 21,294	$ -	$ 21,294
2	$ 22,415	$ -	$ 22,415
3	$ 63,586	$ -	$ 63,586
4	$ 57,482	$ -	$ 57,482
5	$ 43,704	$ -	$ 43,704
6	$ 47,332	$ -	$ 47,332
7	$ 57,727	$ -	$ 57,727
8	$ 36,658	$ -	$ 36,658
9	$ 30,345	$ -	$ 30,345
10	$ 10,314	$ -	$ 10,314
NPV at 10% discount rate			**$242,341**

Under the UECC, CI-Guyana also benefited from fulfillment of its mission to effect biodiversity conservation in Guyana. It can be argued also that the UECC helped Guyana as a country raise its profile of forest management and biodiversity conservation.

Benefits to communities also extended beyond those monetized. Community benefits also include the capital benefits that would be carried between periods and the benefits of operation of this capital, profits from enterprises for example. Community capacity was also improved in many fields including leadership, financial management, and project management.

Though no Conservation Business was operated through the UECC, additional net benefits of profits from such businesses can be realized in cases where viable business opportunities, such as tourism and research, exist. The major impact of conservation management on neighbors is that they may need to absorb additional costs to avoid impacts to conservation concessions but they can benefit from data generated from the site.

Scenario 2: REDD+ without Offset

The effective management of the site for conservation with zero net deforestation will generate emission reduction of about $84,468 annually to the State. This represents the largest single benefit in this scenario. Securing grant funding for concession under this scenario is not likely, or extremely difficult at best, as investors may not see additional benefits to these contributions given that forest conservation would already be compensated under the REDD+ arrangements.

Management costs to the concessionaire represent the largest single cost under this scenario.

Net Present Values at a 10% discount rate under this scenario as determined through the analysis were as follows: Resource Owner $676,610; Resource Manager -$805,382; and Resource User $242,341. More details of the monetized costs and benefits under this scenario are presented in Appendix 7.

Table 4: Results of BCA at 10% discount rate for (a) Resource Owner, (b) Resource Manager, and (c) Resource Users for management as a conservation concession with REDD+ without offset.

(a)

	Total Benefit	Total Cost	Net Benefit
0	$ 20,000	$ -	$ 20,000
1	$ 90,039	$ 12,842	$ 77,197
2	$ 148,460	$ 12,842	$ 135,618
3	$ 129,890	$ 14,414	$ 115,476
4	$ 125,942	$ 15,736	$ 110,205
5	$ 137,658	$ 17,444	$ 120,213
6	$ 115,698	$ 24,061	$ 91,637
7	$ 126,964	$ 26,482	$ 100,482
8	$ 125,983	$ 26,203	$ 99,780
9	$ 126,137	$ 16,384	$ 109,752
10	$ 126,468	$ 21,200	$ 105,267
NPV at 10% discount rate			**$676,610**

(b)

	Total Benefit	Total Cost	Net Benefit
0	$ -	$ 20,000	$ (20,000)
1	$ -	$ 165,136	$ (165,136)
2	$ -	$ 110,682	$ (110,682)
3	$ -	$ 142,062	$ (142,062)
4	$ -	$ 134,039	$ (134,039)
5	$ -	$ 120,613	$ (120,613)
6	$ -	$ 132,114	$ (132,114)
7	$ -	$ 157,810	$ (157,810)
8	$ -	$ 123,124	$ (123,124)
9	$ -	$ 100,590	$ (100,590)
10	$ -	$ 85,951	$ (85,951)
NPV at 10% discount rate			**-$805,382**

(c)

	Total Benefit	Total Cost	Net Benefit
0	$ -	$ -	$ -
1	$ 21,294	$ -	$ 21,294
2	$ 22,415	$ -	$ 22,415
3	$ 63,586	$ -	$ 63,586
4	$ 57,482	$ -	$ 57,482
5	$ 43,704	$ -	$ 43,704
6	$ 47,332	$ -	$ 47,332
7	$ 57,727	$ -	$ 57,727
8	$ 36,658	$ -	$ 36,658
9	$ 30,345	$ -	$ 30,345
10	$ 10,314	$ -	$ 10,314
NPV at 10% discount rate			**$242,341**

Other cost and benefits under this scenario will be similar to those described for scenario 1.

Scenario 3: REDD+ with Offset

The compensation of reduced deforestation by offset payments received by the Resource Manager and additional royalties to the State from gold production are the most significant benefits under this scenario. Costs under this scenario are identical those under Scenario 2.

At the 10% discount rate, NPV of this scenario is $1,463,967 to the Resource Owner, $809,405 to the Resource Manager, and $242,341 to Resource Users. Table 5 below shows the summarized results for this scenario, more details can be found in Appendix 8.

Table 5: Results of BCA at 10% discount rate for (a) Resource Owner, (b) Resource Manager, and (c) Resource Users for management as a conservation concession with REDD+ with offset.

(a)

	Total Benefit	Total Cost	Net Benefit
0	$ 20,000	$ -	$ 20,000
1	$ 145,459	$ 12,842	$ 132,617
2	$ 202,037	$ 12,842	$ 189,195
3	$ 163,401	$ 14,414	$ 148,987
4	$ 221,800	$ 15,736	$ 206,063
5	$ 328,451	$ 17,444	$ 311,007
6	$ 346,247	$ 24,061	$ 322,186
7	$ 494,237	$ 26,482	$ 467,755
8	$ 210,735	$ 26,203	$ 184,532
9	$ 320,559	$ 16,384	$ 304,174
10	$ 237,946	$ 21,200	$ 216,746
NPV at 10% discount rate			**$1,463,967**

(b)

	Total Benefit	Total Cost	Net Benefit
0	$ -	$ 20,000	$ (20,000)
1	$ 174,860	$ 165,136	$ 9,724
2	$ 172,556	$ 110,682	$ 61,874
3	$ 147,474	$ 142,062	$ 5,412
4	$ 225,407	$ 134,039	$ 91,368
5	$ 344,076	$ 120,613	$ 223,463
6	$ 393,771	$ 132,114	$ 261,657
7	$ 564,676	$ 157,810	$ 406,866
8	$ 211,525	$ 123,124	$ 88,401
9	$ 348,612	$ 100,590	$ 248,022
10	$ 244,933	$ 85,951	$ 158,982
NPV at 10% discount rate			**$809,405**

(c)

	Total Benefit	Total Cost	Net Benefit
0	$ -	$ -	$ -
1	$ 21,294	$ -	$ 21,294
2	$ 22,415	$ -	$ 22,415
3	$ 63,586	$ -	$ 63,586
4	$ 57,482	$ -	$ 57,482
5	$ 43,704	$ -	$ 43,704
6	$ 47,332	$ -	$ 47,332
7	$ 57,727	$ -	$ 57,727
8	$ 36,658	$ -	$ 36,658
9	$ 30,345	$ -	$ 30,345
10	$ 10,314	$ -	$ 10,314
	NPV at 10% discount rate		**$242,341**

Other costs and benefits under this scenario are similar to those under Scenario 1.

Scenario 4: Sustainable Logging

Benefit from the sale of logs is the most significant in this scenario. Some emission reduction is also expected under this scenario. The most significant costs are those related to the management of the site by the Resource Manager.

Values for NPV of $455,995 to the Resource Owner; $910,087 to the Resource Manager; and $197,783 to the Resource Users were determined under this scenario at a discount rate of 10%. The summarized results of the analyses under this scenario are presented in Table 6 below; details of monetized costs and benefits can be found in Appendix 9.

Table 6: Results of BCA at 10% discount rate for (a) Resource Owner, (b) Resource Manager, and (c) Resource Users for management as a logging concession using SFM.

(a)

	Total Benefit	Total Cost	Net Benefit
0	$ 20,000	$ -	$ 20,000
1	$ 78,790	$ 17,122	$ 61,667
2	$ 81,851	$ 17,122	$ 64,728
3	$ 80,858	$ 19,218	$ 61,640
4	$ 99,460	$ 20,982	$ 78,479
5	$ 97,968	$ 23,259	$ 74,709
6	$ 95,902	$ 32,081	$ 63,821
7	$ 95,998	$ 35,309	$ 60,689
8	$ 115,570	$ 34,938	$ 80,632
9	$ 117,616	$ 21,846	$ 95,771
10	$ 115,924	$ 28,267	$ 87,657
NPV at 10% discount rate			**$455,995**

(b)

	Total Benefit	Total Cost	Net Benefit
0	$ -	$ 20,000	$ (20,000)
1	$ 310,643	$ 229,464	$ 81,179
2	$ 481,323	$ 355,001	$ 126,322
3	$ 425,957	$ 340,893	$ 85,064
4	$ 556,365	$ 423,427	$ 132,938
5	$ 537,784	$ 405,163	$ 132,621
6	$ 549,755	$ 375,958	$ 173,797
7	$ 596,121	$ 370,697	$ 225,424
8	$ 662,784	$ 452,168	$ 210,616
9	$ 648,284	$ 417,163	$ 231,121
10	$ 695,565	$ 423,791	$ 271,774
NPV at 10% discount rate			**$910,087**

(c)

	Total Benefit	Total Cost	Net Benefit
0	$ -	$ -	$ -
1	$ 18,920	$ -	$ 18,920
2	$ 30,927	$ -	$ 30,927
3	$ 29,641	$ -	$ 29,641
4	$ 37,571	$ -	$ 37,571
5	$ 35,928	$ -	$ 35,928
6	$ 33,165	$ -	$ 33,165
7	$ 32,682	$ -	$ 32,682
8	$ 40,551	$ -	$ 40,551
9	$ 37,203	$ -	$ 37,203
10	$ 37,863	$ -	$ 37,863
	NPV at 10% discount rate		**$197,783**

In addition to the benefits monetized in this analysis, it is expected that this scenario would provide benefits to downstream value-added operations of sawmills and manufacturing, and generate additional applicable royalties and taxes to the State. Benefits are also expected to be derived from the availability of materials for construction.

Some negative impacts to biodiversity and ecosystem service are expected under this scenario. Studies have shown that selective logging can lead to changes in community composition and structure (ter Steege, Welch, & Zagt, 2002). Under sustainable forest management, it is expected that these impacts would however be negligible.

Summary of Results

A summary of the results for all the scenarios is presented in Table 7.

Table 7: Summary of results at 10% discount rate.

	NPV		
	Resource Owner	Resource Manager	Resource User
Conservation Concession	$157,592	$0	$242,341
REDD+ without offset	$676,610	-$805,382	$242,341
REDD+ with offset	$1,463,967	$809,405	$242,341
Logging	$455,995	$910,087	$197,783

Sensitivity Analysis

Scenario 1, Conservation Concession (UECC), seems the least sensitive to changes in discount rate; Scenario 3, REDD+ with Offset, seems most sensitive to changes in the discount rate. The NPV to the Resource Manager seems most affected by changes in the discount rate.

The REDD+ with offset scenario (scenario 3) is affected most by the rate used to calculate the offset payment and the price of gold. Scenario 4 – Sustainable logging – is highly affected by changes in the price of logs and fairly sensitive to the price of carbon.

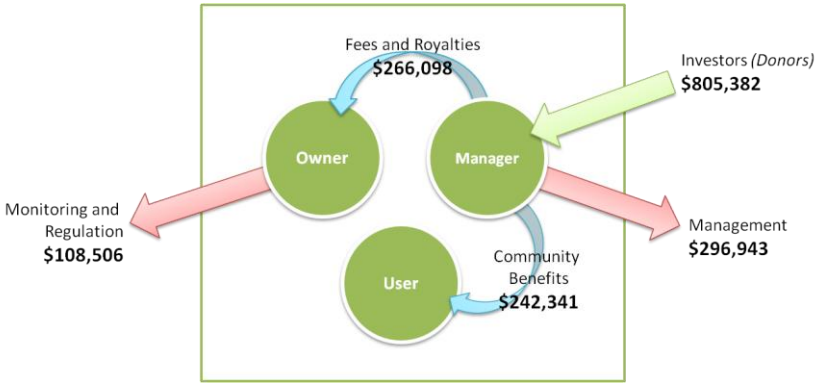
Since only one benefit, economic benefit to communities, and no costs were monetized for Resource Users under the scenarios, the NPV to this stakeholder group is highly sensitive to the level of this benefit.

Discussion and Recommendations

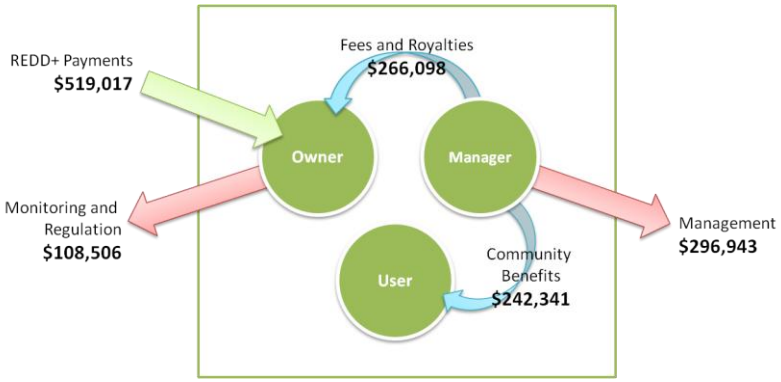
As posited by CI-Guyana (2013), the relationship between the magnitudes of inflows of benefits and outflows of costs to each stakeholder is the major determinant of the success of conservation concessions in Guyana. A generalized representation of these relationships for each scenario is shown in Figure 5 below.

Figure 5: Diagrammatic representation of monetized value flow at present value for (a) Scenario 1, (b) Scenario 2, (c) Scenario 3, and (d) Scenario 4.

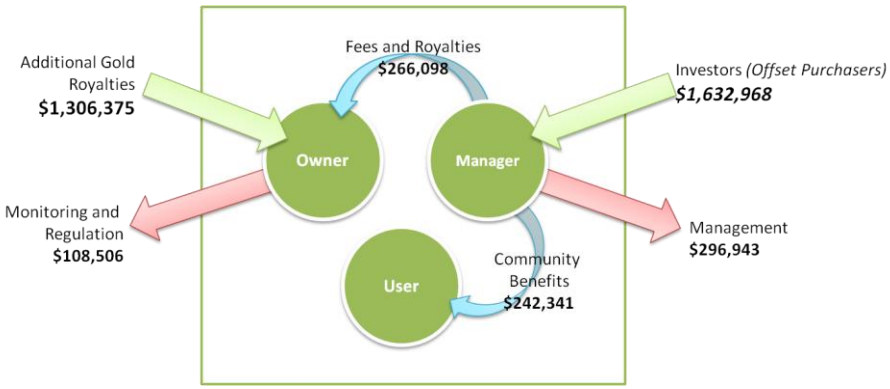
(a)



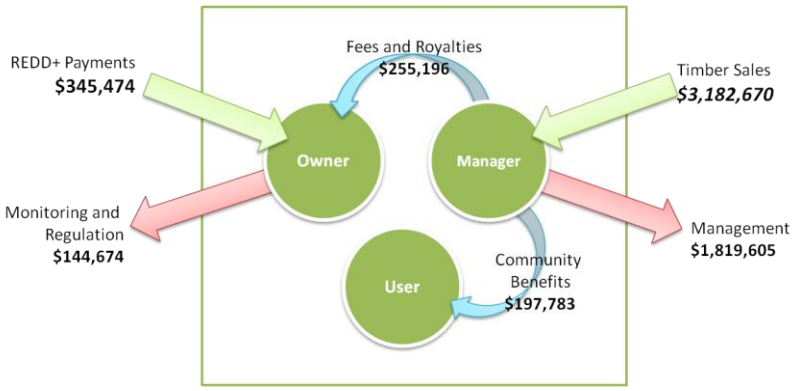
(b)



(c)



(d)



Scenario 3, REDD+ with Offset, showed the best distribution of costs and benefits. Scenario 4, Sustainable Logging, also demonstrated a favorable distribution of costs and benefits. Scenario 4 also showed a lower net flow of value to the Resource Owners and Resource Users and a higher net flow of value to the Resource Manager than Scenario 3.

The NPV of management was at least $0 for each stakeholder under all scenarios except Resource Managers under Scenario 2 (REDD+ without Offset). The highly negative NPV to Resource Managers under Scenario 2 is due to no inflows being identified. Viability of this scenario depends on realizing a better distribution of the benefits and costs to the stakeholders. This can be achieved in cases where viable conservation business opportunities, such as tourism and research, exist at the site. These businesses would need to provide benefits to the Resource Manager sufficient to cover costs borne by the concessionaire. Additionally, lowered payments to the Resource Owner and possibly the Resource User would be necessary to realize a desirable distribution.

Implications for the LCDS and REDD+

Success of Guyana's LCDS and national REDD+ program depends on, *inter alia*, deliberate planning of deforestation to realize total deforestation within the agreed threshold. It is in the best interest of the State to also maximize the economic returns from deforesting activities by improving production efficiency – unit production per hectare of deforestation. The latter point has received much more attention in discussion than the former. Sustainable forest management is the hallmark of the forestry sector; and better exploration, and technologies to reduce impacts and improve recovery in the gold mining industry are being explored.

Deliberate planning of deforestation will require a much more integrated approach to resource exploitation. Regulation of deforestation will be necessary to keep forest loss within agreed limits by transferring responsibility to maintain low rates of deforestation to concessionaires and project developers.

The results of this analysis show that conservation concessions can play a central role in realizing success of the LCDS if offsets are required for activities which generate deforestation in excess of that allowed under regulation. Based on the analysis, with deforestation offsetting in place, a conservation concession the size of the UECC can avoid enough deforestation to enable a miner to produce an additional US$2.5 million worth of gold in one year at 2012 prices, all while keeping deforestation within the agreed threshold. Moreover, considering current under performance by the gold mining sector in terms of efficiency, this figure can be even larger.

Enabling Conservation Concessions

Enabling conservation concessions within the context of Guyana's LCDS framework requires concerted efforts to harmonize forest management and achieve greater integration in the manner in which resources are managed. A series of recommendations for achieving this are presented below.

Firstly, overarching legislated regulation of deforestation needs to be established. By necessity, these regulations must apply to all forest uses and hence must sit within an agency with an ambit beyond single resource management, such as the EPA. These regulations must limit allowable deforestation for land uses, be set in a fair and equitable manner, and make performance a condition of leases and other authorizations. The net effect must be adherence to the deforestation threshold agreed to within the LCDS and the national REDD+ program.

Secondly, mitigation of deforestation in excess of limits must be required. Forest users should be enabled and assisted to apply techniques and technologies to avoid, mitigate or ultimately offset any deforestation beyond the set limit for their particular use. To meet REDD+ reporting conditions, mitigation actions must be immediate and required in the reporting period within which the limit is exceeded.

Efficiencies in offsetting can be achieved through a formal mechanism to facilitate trade between concessionaires with surplus deforestation allowance and those requiring additional allowance to remain in compliance. This market would likely encourage innovation and improve performance over time.

It would also be necessary to strengthen national capacities to monitor and verify performance by concessionaires.

Thirdly, conservation concessions as described within the Forest Act of 2009 must be enabled as an economically self-sustaining forest use. A central aspect of a reformed conservation concession concept for Guyana, within the context of the LCDS, would be its use as deforestation offsets. The participation of conservation concessions in deforestation offsets, as described above, can be achieved while ensuring that the State retains ownership of the carbon content of concessions.

The experience of management of the UECC and the results of this analysis both show that the distribution of costs and benefits of conservation concession management must be carefully addressed. Therefore, conditions for the management of conservation concessions under the Forest Act (2009) must importantly address equitable distribution of potential financial flow amongst the various stakeholders to enable all stakeholders to participate and benefit. This, together with financial inflows from deforestation offsets, as described above; and conservation businesses based on sustainable harvest and use within the concession can be the sources of financial sustainability of the conservation concessions in Guyana under the LCDS.

Importantly, agreements for conservation concessions must also address guaranteed exclusive rights to the concession site. This will ensure that the concessionaire is able to properly manage deforestation within the site and avoid resource use conflicts, and thus better guarantee success.

Conclusion

Conservation concessions can play a major role in realizing success of the LCDS by providing an economically viable forest use that delivers zero deforestation to ensure deliberate management of future deforestation. Realizing this will require legislation regulating deforestation by forest users, and the enabling of deforestation offset trading. This trade in offset can drive innovation and improved practices within the sectors that cause deforestation while at the same time providing a sustainable stream of benefit for conservation concession management.

Enabling conservation concessions within the context of the LCDS will also require the establishment of management conditions and requirements that ensure optimum value flow amongst stakeholders; and exclusive rights of access by conservation concessionaires to concession sites.

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Appendix 1 – VCIF Projects

Years	Apoteri	Rewa	Crash Water
2002 - 2003	Received equipment for acoushi ant and mosquito control (swing-fog machine) and to support tourism (brushcutter). Rehabilitation of sheep flock to promote community-based mutton production.	Received equipment (Stihl 076 chainsaw) to create a shorter river route from Rewa to Annai to reduce the time and energy of travel.	Received equipment (Stihl 076 chainsaw) to collect building materials to improve housing facilities in the community.
2005-2006		Construction of Rewa Eco-lodge.	Construction of Crash Water Community Handicraft Centre.
2009 - 2011	Support with the construction of a multi-purpose benab to offer food and refreshment to river travellers passing by the village. Supported vegetable production for food security. Received one aluminium boat to improve transportation and capacity to respond to emergencies.	Enhanced the hospitality facilities at the Eco-Lodge with three extra cabins and solar voltaic equipment. Received an aluminium boat and a 40hp outboard engine to improve river transportation for tourists.	Supported to commence commercial crab oil (*Carapa guianensis*) production as part of enterprise development in the village. Support to improve potable water distribution to households in the village. Provided with motorised equipment to enhance cassava grating for the commercial production of by-products (e.g. farine).
2012	Training in specialized small engine repair for all three communities.		

Appendix 2 – Modeling of Log Production, Potential Costs and Revenue, and Emission Effects

a. Annual Allowable Cut

The annual allowable cut from the site was determined following the guidelines set out by the GFC[1].

Total Area Size (ha)			82,199
Non Productive Forests + Slope and waterway buffers(ha)[2]			12,080
Productive Forests/Loggable Forests (ha)			70,119
Biodiversity Area (ha)			3,155
Available Production Area (ha)			66,963
Net Productive Forest (ha)			53,571
Cutting Cycles (years)	25	40	60
Cutting Intensity (m^3/ha)	8.33	13.33	20.00
Total Allowable Cut (m^3)	446,245	714,099	1,071,416
Annual Allowable Cut (m^3/year)	17,850	17,852	17,857
Annual Allowable Area (ha/year)	2,143	1,339	893
Number of blocks (per year)	21	13	9

b. Estimated Annual Log Production

Year	Total Production Allocations less SFEPs and UECC)[3]	Estimated Net Productive Forest (ha)[4]	Estimated Total Allowable Cut (m3)	Estimated Annual Alllowable Cut (m3)	Actual log production (m^3)[5]	Actual production as a percentage of Annual Allowable Cut	Estimated production from 82,199 ha concession (m^3)
2003	6,107,009*	3,926,494	78,529,881	1,308,831	236,215	18.0%	3,223
2004	6,107,009*	3,926,494	78,529,881	1,308,831	366,000	28.0%	4,993
2005	6,107,009*	3,926,494	78,529,881	1,308,831	323,900	24.7%	4,419
2006	6,107,009	3,926,494	78,529,881	1,308,831	394,000	30.1%	5,376
2007	6,110,008	3,928,449	78,568,972	1,309,483	330,374	25.2%	4,505
2008	5,872,152	3,773,433	75,468,658	1,257,811	275,320	21.9%	3,909
2009	5,967,644	3,835,667	76,713,340	1,278,556	266,198	20.8%	3,718
2010	6,036,899	3,880,802	77,616,039	1,293,601	320,091	24.7%	4,419
2011	6,253,619	4,022,043	80,440,857	1,340,681	294,628	22.0%	3,924
2012	5,992,148	3,851,637	77,032,738	1,283,879	277,447	21.6%	3,859

* = *Estimated*

[1] *Annual Plan of Operations Guidelines for Timber Harvesting Outline of Information Requirements*
[2] *Estimated using spatial analysis*
[3] *Data from Forest Sector Information Reports for 2006 to 2012*
[4] *Assuming same percentage of Net Productive forest to Total Area as in UECC*
[5] *Data from Forest Sector Information Reports for 2003 to 2012*

C. Emission reduction and value estimation

Year	Deforestation from forestry activities (ha)[6]	Total log production (m^3)[7]	Production efficiency (ha/m^3)	Estimated production from concession (m^3)	Estimated deforestation in concession (ha)	Estimated avoided deforestation (ha)[8]	Estimated Emission reduction (ton CO_2e)[9]	Value (US$)[10]
2003	1684	236,215	0.0071	3,223	22.98	23.05	8,461	$ 42,305
2004	1684	366,000	0.0046	4,993	22.98	23.05	8,461	$ 42,305
2005	1684	323,900	0.0052	4,419	22.98	23.05	8,461	$ 42,305
2006	1007	394,000	0.0026	5,376	13.74	32.29	11,851	$ 59,254
2007	1007	330,374	0.0030	4,505	13.73	32.30	11,853	$ 59,267
2008	1007	275,320	0.0037	3,909	14.30	31.73	11,646	$ 58,232
2009	1007	266,198	0.0038	3,718	14.06	31.97	11,731	$ 58,657
2010	294	320,091	0.0009	4,419	4.06	41.97	15,404	$ 77,018
2011	186	294,628	0.0006	3,924	2.48	43.55	15,984	$ 79,919
2012	240	277,447	0.0009	3,859	3.34	42.69	15,668	$ 78,340

D. Average Royalty rate

Category	Royalty rate[11]	Proportion of Production[12]	Weighted rate
Special Class	$ 2.47	44%	$ 1.09
Class 1	$ 1.41	34%	$ 0.48
Class 2	$ 0.88	14%	$ 0.12
Class 3	$ 0.53	7%	$ 0.04
Average royalty rate $/m3			$ 1.73

[6] *Data from GFC, 2011a, 2012b, 2013*
[7] *Data from Forest Sector Information Reports for 2003 to 2012*
[8] *The difference between the allowed deforestation (46.03 ha) and the estimated deforestation*
[9] *Estimated avoided deforestation multiplied conversion factor of 367*
[10] *Calculated at $5 per ton avoided emission*
[11] *Source GFC. See Appendix 5 for more details*
[12] *Data derived from GFC, 2006*

E. Royalty estimation

Year	Estimated log production form concession (m3)	Estimated royalty ($)[13]
2003	3,223	$ 5,571
2004	4,993	$ 8,632
2005	4,419	$ 7,639
2006	5,376	$ 9,292
2007	4,505	$ 7,788
2008	3,909	$ 6,757
2009	3,718	$ 6,427
2010	4,419	$ 7,638
2011	3,924	$ 6,784
2012	3,859	$ 6,671

F. Timber Sales Value

Year	Estimated log production form concession (m3)	Average domestic log price (US$/m3)[14]	Value (US$)
2003	3,223	96.39*	$ 310,643
2004	4,993	96.39*	$ 481,323
2005	4,419	96.39	$ 425,957
2006	5,376	103.5	$ 556,365
2007	4,505	119.37	$ 537,784
2008	3,909	140.65	$ 549,755
2009	3,718	160.34	$ 596,121
2010	4,419	150	$ 662,784
2011	3,924	165.2	$ 648,284
2012	3,859	180.25	$ 695,565

* = *Estimated*

[13] *Determined as the product of the estimated production from concession and the average royalty rate*
[14] *Data from Forest Sector Information Reports for 2006 to 2012*

G. Management Costs

	Rate of Inflation[15]	Management Cost ($/m3)
2003	5.0%	$58.71
2004	5.5%	$61.93
2005	8.3%	$67.08
2006	4.2%	$69.89
2007	14.1%	$79.75
2008	6.4%	$84.85
2009	3.6%	$87.91
2010	4.4%	$91.77
2011	3.3%	$94.80
2012	3.5%	$98.12

Appendix 3: Modeling of Offset Value

Year	Annualized deforestation from mining[16]	Gold production[17]		Gold production efficiency	Projected gold production by no deforestation in 82,199 hectares	Average Gold Price[18]	Additional gold revenue for conservation management	Offset Value[19]	Additional Royalty[20]
	ha	kg	oz	oz/ha	oz	US$/oz	US$	US$	US$
2003	4,288	12,172	391,335	91.3	4,201	416.25	$ 1,748,596	$174,860	$ 139,888
2004	4,288	11,478	369,025	86.1	3,961	435.60	$ 1,725,561	$172,556	$ 138,045
2005	4,288	8,329	267,801	62.5	2,875	513.00	$ 1,474,738	$147,474	$ 117,979
2006	2,658	6,406	205,951	77.5	3,567	632.00	$ 2,254,070	$225,407	$ 180,326
2007	2,658	7,412	238,305	89.7	4,127	833.75	$ 3,440,765	$344,076	$ 275,261
2008	2,658	8,131	261,435	98.4	4,527	869.75	$ 3,937,708	$393,771	$ 315,017
2009	2,658	9,326	299,836	112.8	5,192	1,087.50	$ 5,646,757	$564,676	$ 451,741
2010	9,384	9,543	306,816	32.7	1,505	1,405.50	$ 2,115,251	$211,525	$ 169,220
2011	7,340	11,293	363,097	49.5	2,277	1,531.00	$ 3,486,122	$348,612	$ 278,890
2012	13,664	13,644	438,662	32.1	1,478	1,657.50	$ 2,449,326	$244,933	$ 195,946

[15] *Data provided by the Bank of Guyana*
[16] *Data from GFC, 2011a, 2012b, 2013*
[17] *Data from GGMC*
[18] *Data from the World Gold Council (www.gold.org)*
[19] *10% of additional gold revenue*
[20] *8% of additional gold revenue*

Appendix 4: Concession Regulation and Monitoring Estimation

	Total Expenditure (G$)[21]	Exchange Rate (G$/US$)[22]	Total Expenditure (US$)	Total Forest Allocation[23]	Cost per hectare	Estimated cost for Logging	Estimated cost for Conservation
2003	$398,510,310*	193.81	$ 2,056,191	$6,695,871*	$ 0.21	$17,669.36	$ 13,252.02
2004	$398,510,310	198.32	$ 2,009,431	$6,695,871*	$ 0.21	$17,267.54	$ 12,950.66
2005	$447,286,498	199.88	$ 2,237,775	$6,695,871*	$ 0.23	$19,229.76	$ 14,422.32
2006	$488,327,176	200.19	$ 2,439,319	$6,695,871	$ 0.26	$20,961.68	$ 15,721.26
2007	$560,220,748	202.48	$ 2,766,795	$6,929,471	$ 0.28	$22,974.26	$ 17,230.70
2008	$731,570,366	203.765	$ 3,590,265	$6,560,584	$ 0.38	$31,488.25	$ 23,616.19
2009	$820,121,473	203.925	$ 4,021,682	$6,682,335	$ 0.42	$34,629.33	$ 25,971.99
2010	$834,183,348	203.465	$ 4,099,886	$6,869,161	$ 0.42	$34,342.56	$ 25,756.92
2011	$553,710,000	204.085	$ 2,713,134	$7,292,076	$ 0.26	$21,408.42	$ 16,056.32
2012	$690,576,718	204.3575	$ 3,379,258	$7,028,526	$ 0.34	$27,664.43	$ 20,748.32

***** = *Estimated*

Appendix 5: Timber Royalty Rates[24]

Timber Species		*Rates*
Special Category	Greenheart	G$494.41 per cubic metre
	Brown Silverballi	
	Purpleheart	
	Red Cedar	
	Letterwood	
	Bulletwood	
Class I	Crabwood	G$282.52 per cubic metre
	Yellow Silverballi	
	Itikiboroballi	
	Locust	
	Tatabu	
	Determa	
	Wamara	
	Kabukalli	
	Shibadan	
	Tauroniro	
	Manniballi	
	Washiba	
	Hakia	
	Dalli	
	Suya	
	Ulu	

[21] *Data from GFC Annual Reports 2005 to 2012*
[22] *Data from Bank of Guyana*
[23] *Data from Forest Sector Information Reports for 2006 to 2012*
[24] *Source GFC*

Timber Species		*Rates*
	Simarupa	
	Aromata	
	Mora	
	Morabukea	
	Hububalli	
Class II	Baromalli	G$176.57 per cubic metre
	Dukali	
	Kereti Silverballi	
	Kurahara Silverballi	
	(Dolhypar)	
	Wabaima	
	Karohoro	
	Baradan	
	Ubudi	
	Kirikaua	
	Maporokon	
	Monkey Pot	
	Manni	
	Pakuri	
	Yaruru (Yarula)	
	Muniridan	
	Wallaba	
Class III	Burada	G$105.94 per cubic metre
	Duka	
	Dukuria	
	Fukadi (Coffee mortar)	
	Inyak	
	Limonaballi	
	Suradan	
	White Cedar	
	Futui	
	Halchiballi	
	Haiariballi	
	Huruasa	
	Iteballi	
	Couriballi	
	Kakaralli	
	Kauta	
	Kautaballi	
	Korokororo (Crook)	
	Kuyama	
	Maho	
	Warakaioro	

Appendix 6: Details of Benefits and Cost for Scenario 1

(a) Resource Owner

	Benefit		Cost	
	Concession and other fees	**Total**	Monitoring and Regulation	**Total**
0	$20,000	**$20,000**		**-**
1	$5,571	**$5,571**	$12,842	**$12,842**
2	$63,992	**$63,992**	$12,842	**$12,842**
3	$45,422	**$45,422**	$14,414	**$14,414**
4	$41,474	**$41,474**	$15,736	**$15,736**
5	$53,190	**$53,190**	$17,444	**$17,444**
6	$31,230	**$31,230**	$24,061	**$24,061**
7	$42,496	**$42,496**	$26,482	**$26,482**
8	$41,515	**$41,515**	$26,203	**$26,203**
9	$41,669	**$41,669**	$16,384	**$16,384**
10	$42,000	**$42,000**	$21,200	**$21,200**

(b) Resource Manager

	Benefit		Cost			
	Grants	**Total**	Concession and other fees	Community development and other projects	Management Costs	**Total**
0	$20,000	**$20,000**	$20,000			**$20,000**
1	$145,136	**$145,136**	$5,571	$4,835	$134,730	**$145,136**
2	$110,682	**$110,682**	$63,992	-	$46,690	**$110,682**
3	$142,062	**$142,062**	$45,422	$8,581	$88,059	**$142,062**
4	$134,039	**$134,039**	$41,474	$25,787	$66,778	**$134,039**
5	$120,613	**$120,613**	$53,190	$8,902	$58,521	**$120,613**
6	$132,114	**$132,114**	$31,230	$11,062	$89,822	**$132,114**
7	$157,810	**$157,810**	$42,496	$10,041	$105,273	**$157,810**
8	$123,124	**$123,124**	$41,515	$10,000	$71,609	**$123,124**
9	$100,590	**$100,590**	$41,669	$16,412	$42,509	**$100,590**
10	$85,951	**$85,951**	$42,000	$10,000	$33,951	**$85,951**

(c) Resource User

	Benefits		Cost
	Economic Benefits to Communities	**Total**	**Total**
0		**-**	**-**
1	$21,294	**$21,294**	**-**
2	$22,415	**$22,415**	**-**
3	$63,586	**$63,586**	**-**
4	$57,482	**$57,482**	**-**
5	$43,704	**$43,704**	**-**
6	$47,332	**$47,332**	**-**
7	$57,727	**$57,727**	**-**
8	$36,658	**$36,658**	**-**
9	$30,345	**$30,345**	**-**
10	$10,314	**$10,314**	**-**

Appendix 7: Details of Benefits and Cost for Scenario 2

(a) Resource Owner

	Benefit			Cost	
	Concession and other fees	Reduced emissions	**Total**	Monitoring and Regulation	**Total**
0	$20,000		**$20,000**		**-**
1	$5,571	$84,468	**$90,039**	$12,842	**$12,842**
2	$63,992	$84,468	**$148,460**	$12,842	**$12,842**
3	$45,422	$84,468	**$129,890**	$14,414	**$14,414**
4	$41,474	$84,468	**$125,942**	$15,736	**$15,736**
5	$53,190	$84,468	**$137,658**	$17,444	**$17,444**
6	$31,230	$84,468	**$115,698**	$24,061	**$24,061**
7	$42,496	$84,468	**$126,964**	$26,482	**$26,482**
8	$41,515	$84,468	**$125,983**	$26,203	**$26,203**
9	$41,669	$84,468	**$126,137**	$16,384	**$16,384**
10	$42,000	$84,468	**$126,468**	$21,200	**$21,200**

(b) Resource Manager

	Benefit	**Cost**			
	Total	Concession and other fees	Community development and other projects	Management Costs	**Total**
0	**-**	$20,000			**$20,000**
1	**-**	$25,571	$4,835	$134,730	**$165,136**
2	**-**	$63,992	-	$46,690	**$110,682**
3	**-**	$45,422	$8,581	$88,059	**$142,062**
4	**-**	$41,474	$25,787	$66,778	**$134,039**
5	**-**	$53,190	$8,902	$58,521	**$120,613**
6	**-**	$31,230	$11,062	$89,822	**$132,114**
7	**-**	$42,496	$10,041	$105,273	**$157,810**
8	**-**	$41,515	$10,000	$71,609	**$123,124**
9	**-**	$41,669	$16,412	$42,509	**$100,590**
10	**-**	$42,000	$10,000	$33,951	**$85,951**

(c) Resource User

	Benefits		**Cost**
	Economic Benefits to Communities	**Total**	**Total**
0		**-**	**-**
1	$21,294	**$21,294**	**-**
2	$22,415	**$22,415**	**-**
3	$63,586	**$63,586**	**-**
4	$57,482	**$57,482**	**-**
5	$43,704	**$43,704**	**-**
6	$47,332	**$47,332**	**-**
7	$57,727	**$57,727**	**-**
8	$36,658	**$36,658**	**-**
9	$30,345	**$30,345**	**-**
10	$10,314	**$10,314**	**-**

Appendix 8: Details of Benefits and Cost for Scenario 3

(a) Resource Owner

	Benefit			Cost	
	Concession and other fees	Additional Gold Royalty	**Total**	Monitoring and Regulation	**Total**
0	$20,000		**$20,000**		**-**
1	$5,571	$139,888	**$145,459**	$12,842	**$12,842**
2	$63,992	$138,045	**$202,037**	$12,842	**$12,842**
3	$45,422	$117,979	**$163,401**	$14,414	**$14,414**
4	$41,474	$180,326	**$221,800**	$15,736	**$15,736**
5	$53,190	$275,261	**$328,451**	$17,444	**$17,444**
6	$31,230	$315,017	**$346,247**	$24,061	**$24,061**
7	$42,496	$451,741	**$494,237**	$26,482	**$26,482**
8	$41,515	$169,220	**$210,735**	$26,203	**$26,203**
9	$41,669	$278,890	**$320,559**	$16,384	**$16,384**
10	$42,000	$195,946	**$237,946**	$21,200	**$21,200**

(b) Resource Manager

	Benefit		Cost			
	Offset and other investments	**Total**	Concession and other fees	Community development and other projects	Management Costs	**Total**
0		**-**	$20,000			**$20,000**
1	$174,860	**$174,860**	$25,571	$4,835	$134,730	**$165,136**
2	$172,556	**$172,556**	$63,992	-	$46,690	**$110,682**
3	$147,474	**$147,474**	$45,422	$8,581	$88,059	**$142,062**
4	$225,407	**$225,407**	$41,474	$25,787	$66,778	**$134,039**
5	$344,076	**$344,076**	$53,190	$8,902	$58,521	**$120,613**
6	$ 393,771	**$393,771**	$31,230	$11,062	$89,822	**$132,114**
7	$ 564,676	**$564,676**	$42,496	$10,041	$105,273	**$157,810**
8	$ 211,525	**$211,525**	$41,515	$10,000	$71,609	**$123,124**
9	$ 348,612	**$348,612**	$41,669	$16,412	$42,509	**$100,590**
10	$ 244,933	**$244,933**	$42,000	$10,000	$33,951	**$85,951**

(c) Resource User

	Benefits		Cost
	Economic Benefits to Communities	**Total**	**Total**
0		**-**	**-**
1	$21,294	**$21,294**	**-**
2	$22,415	**$22,415**	**-**
3	$63,586	**$63,586**	**-**
4	$57,482	**$57,482**	**-**
5	$43,704	**$43,704**	**-**
6	$47,332	**$47,332**	**-**
7	$57,727	**$57,727**	**-**
8	$36,658	**$36,658**	**-**
9	$30,345	**$30,345**	**-**
10	$10,314	**$10,314**	**-**

Appendix 9: Details of Benefits and Cost for Scenario 4

(a) Resource Owner

	Benefit				Cost	
	Concession and other fees	Timber Royalties	Reduced emissions	**Total**	Monitoring and Regulation	**Total**
0	$20,000			**$20,000**		**-**
1	$30,914	$5,571	$42,305	**$78,790**	$17,122	**$17,122**
2	$30,914	$8,632	$42,305	**$81,851**	$17,122	**$17,122**
3	$30,914	$7,639	$42,305	**$80,858**	$19,218	**$19,218**
4	$30,914	$9,292	$59,254	**$99,460**	$20,982	**$20,982**
5	$30,914	$7,788	$59,267	**$97,968**	$23,259	**$23,259**
6	$30,914	$6,757	$58,232	**$95,902**	$32,081	**$32,081**
7	$30,914	$6,427	$58,657	**$95,998**	$35,309	**$35,309**
8	$30,914	$7,638	$77,018	**$115,570**	$34,938	**$34,938**
9	$30,914	$6,784	$79,919	**$117,616**	$21,846	**$21,846**
10	$30,914	$6,671	$78,340	**$115,924**	$28,267	**$28,267**

(b) Resource Manager

	Benefit		Cost				
	Timber Sales	**Total**	Concession and other fees	Timber Royalties	Community development and other projects	Management Costs	**Total**
0		**-**	$20,000				**$20,000**
1	$310,643	**$310,643**	$30,914	$5,571	$3,784	$189,195	**$229,464**
2	$481,323	**$481,323**	$30,914	$8,632	$6,185	$309,270	**$355,001**
3	$425,957	**$425,957**	$30,914	$7,639	$5,928	$296,412	**$340,893**
4	$556,365	**$556,365**	$30,914	$9,292	$7,514	$375,707	**$423,427**
5	$537,784	**$537,784**	$30,914	$7,788	$7,186	$359,276	**$405,163**
6	$549,755	**$549,755**	$30,914	$6,757	$6,633	$331,654	**$375,958**
7	$596,121	**$596,121**	$30,914	$6,427	$6,536	$326,820	**$370,697**
8	$662,784	**$662,784**	$30,914	$7,638	$8,110	$405,506	**$452,168**
9	$648,284	**$648,284**	$30,914	$6,784	$7,441	$372,025	**$417,163**
10	$695,565	**$695,565**	$30,914	$6,671	$7,573	$378,634	**$423,791**

(c) Resource User

	Benefits		Cost
	Economic Benefits to Communities	**Total**	**Total**
0		**-**	**-**
1	$18,920	**$18,920**	**-**
2	$30,927	**$30,927**	**-**
3	$29,641	**$29,641**	**-**
4	$37,571	**$37,571**	**-**
5	$35,928	**$35,928**	**-**
6	$33,165	**$33,165**	**-**
7	$32,682	**$32,682**	**-**
8	$40,551	**$40,551**	**-**
9	$37,203	**$37,203**	**-**
10	$37,863	**$37,863**	**-**